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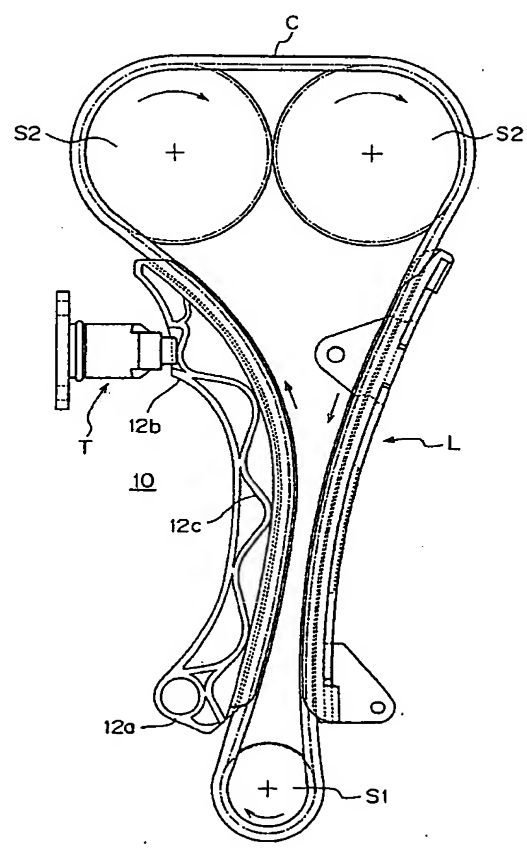
(54) Synthetic resin guide for transmission device

(57) A synthetic resin guide L for a transmission device comprises an elongated rail 11 for longitudinal sliding engagement with a power transmission medium, and a rail supporting member 12 molded as a unit with the rail. The supporting member 12 comprises a plurality of reinforcing ribs 12c which support the rail 11. The ribs 12c are distributed along the length of the transmission device from a location adjacent one end of the rail 11 to a location adjacent the opposite end of the rail 11. The guide L is formed by injection molding and the reinforcing ribs 12c extend in directions following the flow of synthetic resin during injection molding. Preferably the synthetic resin is a glass fiber reinforced resin. By forming the reinforcing ribs 12c in this manner, high strength and toughness are imparted to the guide L, and warpage and torsion, which would otherwise be encountered in a high temperature transmission environment, are reduced.

FIG. 1



EP 1 291 553 A2

Description

[0001] This invention relates to guides for sliding engagement with chains, belts and other power transmission media such as those used in a motor vehicle engine or the like for transmitting power from a driving sprocket or pulley to a driven sprocket or pulley. These guides may be fixed guides, or movable guides associated with tensioners. More specifically, the invention relates to improvements in guides formed of synthetic resins.

[0002] In general, in a transmission device for a motor vehicle engine or the like, in which mechanical power is transmitted by a medium such as a chain, belt or the like, a movable or fixed guide is attached to a body frame, such as an engine block wall, by a mounting bolt, a pin or the like. The chain, belt, or other power transmission medium, travels in sliding contact with the guide.

[0003] In the case of a movable guide, which may be in the form of a tension lever or the like, the guide provides the power transmission medium with appropriate tension to prevent transmission failure resulting from excessive stretching, or excessive loosening, of the power transmission medium. A fixed guide, such as a guide rail or the like, limits the power transmission medium to a predetermined traveling path to prevent vibration noise, side vibration, and disengagement.

[0004] FIG. 13 illustrates an example of a conventional synthetic resin guide 100 for a tensioner lever. The guide 100 comprises a slide rail 101, which is in sliding contact with a traveling chain C, and a rail supporting member 102 provided on the back side of the slide rail 101. The rail supporting member 102 includes a boss 102a having a mounting hole 103 for pivoting attachment to an engine block wall. The rail supporting member also includes a tensioner abutting portion 102b, which cooperates with a tensioner (not shown) for providing appropriate tension to prevent transmission failure resulting from excessive stretching, or excessive loosening, of the chain. The synthetic resin guide 100 includes a plurality of thick reinforcing ribs 102c, each formed at suitable intervals along the rail supporting member 102, to enhance the mechanical properties and toughness of the guide 100.

[0005] The conventional synthetic resin guide 100 has several problems preventing it from exhibiting good mechanical properties and toughness. When the guide is injection-molded from an injection gate provided on one end portion of the guide, the reinforcing ribs 102c extend substantially perpendicular to the direction of injection of the synthetic resin P. As a result of the orientation of the reinforcing ribs, the flow of the injected synthetic resin P, which, as shown in FIG. 14, comprises a skin layer-forming resin P1 and a core layer-forming resin P2, exhibits a stagnant fluid state within and around the interior of the reinforcing ribs 102c. The residence, eddy flow, and turbulent flow of the resin P prevent the resin from achieving a strain-free molecular orientation in the interior of the reinforcing ribs 102c. Consequently, the peripheral portions of the ribs are solidified in an strained state. The orientation strain not only causes cracks due to loading during power transmission, but also causes thermal shrinkage resulting from a non-crystalline region in the synthetic resin P. Accordingly, strains such as warpage, torsion and the like occur in a high temperature environment such as in an automobile engine, and the guiding function is not entirely satisfactory.

[0006] Referring to FIGs. 15 and 16, when a synthetic resin P, composed of a glass fiber reinforced resin (consisting of a skin layer forming resin P1 and a core layer forming resin P2) is used, ideal mechanical properties and toughness are exhibited when the reinforcing glass fibers F contained in the core layer forming resin are oriented in a direction substantially parallel to the slide rail 101. However, as described above, since the reinforcing rib portions 102c extend substantially perpendicular to the direction of injection of the synthetic resin P, the resin is in a stagnant fluid state in the interiors of the respective reinforcing ribs 102c, and in the peripheral portions thereof. Residence, eddy flow, turbulent flow and the like are generated in the fluid resin, and, as a result, as shown in FIG. 16, the orientation of the glass fibers is disturbed. Thus, in spite of the mixing of glass fibers F in the synthetic resin P to increase the strength of the guide, ideal strength cannot be achieved.

[0007] Furthermore, since the reinforcing rib portions 102c impair the flow of the glass fiber-reinforced synthetic resin P, moldability during injection molding is unsatisfactory. Thus, glass fibers F cannot be dispersed in such a way that they are oriented in a specified direction, and cannot be mixed uniformly in the resin. To solve this problem, changing the injection conditions has been tried. However, a higher injection pressure and a longer injection time are required, thereby increasing the cost of injection molding.

[0008] Accordingly, objects of the invention are to solve the above-mentioned problems encountered in the prior art, and to provide a synthetic resin guide for a transmission device including reinforcing portions, which exhibits greater strength and toughness, and in which strains such as warpage, torsion and the like in a high temperature environment are significantly reduced.

[0009] The synthetic resin guide in accordance with the invention comprises an elongated rail for longitudinal sliding engagement with a power transmission medium, and a rail supporting member molded as a unit with the rail. The supporting member comprises a plurality of reinforcing ribs which support the rail. These ribs are distributed along the length of the transmission device from a location adjacent one end of the rail to a location adjacent the opposite end of the rail. The guide is formed by injection molding, and, in order to achieve the above-mentioned objects, the reinforcing ribs extend in directions such that the flow of synthetic resin during injection molding substantially follows the longi-

tudinal directions of the reinforcing ribs. Preferably, the synthetic resin is a glass fiber reinforced resin. The synthetic resin guide in accordance with the invention, may be either a fixed guide or a movable guide.

[0010] In order for the reinforcing ribs to extend in a direction following the flow of resin during injection molding, any arrangement such as an S-shaped arrangement, a curved arrangement, a truss-shaped arrangement, a vein-shaped arrangement, a honeycomb-shaped arrangement, or the like, may be used.

[0011] The injection molding process used to produce the synthetic resin guide according to the invention can be an injection molding process in which resin processing is integrally carried out from one end portion in a longitudinal direction of the guide toward the other end portion. For example, any process such as a typical injection molding process using a single synthetic resin, a two-color injection molding process using two kinds of synthetic resins, a sandwich injection molding process in which a core layer resin is injected inside a skin layer, or the like, may be used.

[0012] According to the invention the reinforcing rib portions which supports the slide rail extend in directions following the flow of synthetic resin during injection molding of the guide. Thus the reinforcing rib portions behave as auxiliary flow paths, which lead the synthetic resin injected during the injection molding of the guide from one end portion in a longitudinal direction of the guide toward the other end portion, so that injected synthetic resin flows throughout the guide without significant flow resistance, so that the injected synthetic resin flows smoothly to the end of the synthetic resin guide.

[0013] Since the synthetic resin is fully molecularly-oriented when solidified, the crystal region of the synthetic resin is increased and thermal shrinkage of the guide is reduced. Furthermore, the pressure required for injection molding of the guide can be reduced to a lower level than in the conventional case, and the injection time can also be reduced.

[0014] FIG. 1 is a front elevational view illustrating a transmission guide in accordance with the invention in use in a motor vehicle engine;

[0015] FIG. 2 is a schematic elevational illustrating the flow of resin during injection molding of a guide in accordance with the invention;

[0016] FIG. 3 is a cross-sectional view of a reinforcing rib taken on plane A-A in FIG. 2;

[0017] FIG. 4 is a cross-sectional view corresponding to FIG. 3, but illustrating a case in which a glass fiber reinforcing resin is used;

[0018] FIG. 5 is a schematic elevational view showing the relationship between an S-shaped reinforcing rib and the flow of resin;

[0019] FIG. 6 is a schematic elevational view showing the relationship between a truss-shaped reinforcing rib and the flow of resin;

[0020] FIG. 7 is a schematic elevational view showing the relationship between radial, linear, reinforcing ribs and the flow of resin;

[0021] FIG. 8 is a schematic elevational view showing the relationship between radial, curved, reinforcing ribs and the flow of resin;

[0022] FIG. 9 is a schematic elevational view showing the relationship between linear, vein-shaped, reinforcing ribs and the flow of resin;

[0023] FIG. 10 is a schematic elevational view showing a relationship between curved, vein-shaped, curve reinforcing ribs and the flow of resin;

[0024] FIG. 11 is a schematic elevational view showing the relationship between honeycomb-shaped reinforcing ribs and the flow of resin;

[0025] FIG. 12 is a schematic elevational view showing the relationship between reinforcing ribs formed in a number-sign pattern and the flow of resin.

[0026] FIG. 13 is a view illustrating an example of a conventional synthetic resin guide for a transmission device;

[0027] FIG. 14 is a cross-sectional view taken on plane B-B in FIG. 13;

[0028] FIG. 15 is a view showing the ideal orientation of glass fibers in a guide; and

[0029] FIG. 16 a cross-sectional view taken on plane B-B in FIG. 13 illustrating a case in which a glass fiber reinforcing resin was used.

[0030] Preferred embodiments of a synthetic resin transmission device guide according to the invention for a motor vehicle engine (hereinafter referred to as a transmission guide) will be described below with reference to the drawings.

[0031] As shown in FIG. 1, a transmission, for valve timing in a motor vehicle engine, transmits power by means of a chain C, which travels around a driving sprocket S and driven sprockets S2 in a circulating path. A movable transmission guide 10 guides, and applies tension to, the chain C, as the chain slides on the guide. A fixed guide L, along which the chain slides, is also provided. However, unlike the transmission guide 10, the fixed guide does not have a reinforcing rib portion.

[0032] As shown in FIG. 2, the transmission guide comprises a slide rail 11, having on one side a substantially arc-shaped sliding contact surface on which a chain C slides, and, on its opposite side, a rail supporting member 12, which extends in perpendicular relationship to the sliding contact surface, along the length of the guide. The rail supporting member 12 includes a boss 12a having a mounting hole 13, for pivotally mounting the guide on a wall of an engine block so that it can serve as a movable guide, and portion 12b for abutting a tensioner T (FIG. 1), in order to apply appropriate tension to the chain C to prevent transmission failure resulting from excessive stretching or loosening of the chain. The guide also has reinforcing rib portions 12c which serve both a reinforcing and weight-reducing function.

[0033] The slide rail 11 and rail supporting member 12 are integrally molded as a unit by injection molding. A synthetic resin P is injected through a gate G, provided

at one end in the longitudinal direction of the guide. The reinforcing rib portions 12c extend in an S-shaped configuration, to correspond to the direction of injection of the synthetic resin P. Consequently, the synthetic resin P, injected through the gate G, flows to the reinforcing rib portions 12c along an auxiliary flow path as shown by arrows D in FIG. 2, so that the resin is injected into the entire guide with a minimum of flow resistance. The resin P does not remain stationary at the reinforcing rib portions 12c during injection molding, and no eddy flow or turbulent flow occurs. Consequently, the synthetic resin P can be injected smoothly to the end of the guide opposite the gate G. As a result, the synthetic resin P is molecularly oriented when it is solidified.

[0034] The transmission guide 10 thus obtained has an increased crystal region of injection-molded synthetic resin P, and accordingly, the strength and toughness of the guide are dramatically improved. Further, because the crystal region is increased, thermal shrinkage of the guide is reduced, strains such as warpage, torsion and the like are less likely to occur even in a high temperature transmission environment, and a stable transmission guiding function can be achieved.

[0035] As illustrated in FIG. 3, a sandwich injection molding process may be used to form the transmission guide. In sandwich injection molding, a resin P2, which forms a core layer, is injected into the interior of a sheath composed of a resin P1, which forms a skin layer. As shown, the core layer is injected into the interior of the reinforcing rib portions 12c. Since the injection ratio of the core layer forming resin P2 can be increased, the strength and toughness of the guide can be improved.

[0036] When the core layer resin P2 consists of a glass fiber reinforced resin, the reinforcing glass fibers F are uniformly dispersed in the resin and oriented in the injection direction (the direction of the normal to the a cross section in FIG. 4). With the use of glass fibers, the strength and toughness of the guide can be further enhanced.

[0037] The transmission guide 10 can be produced by a conventional injection molding apparatus, except that the mold is shaped so that the reinforcing ribs follow the direction of injection of the synthetic resin P during injection molding.

[0038] The synthetic resins P, used for the transmission guide 10 are not particularly limited, and any one of the synthetic resins, which have been used in the injection molding, such as nylon 6, nylon 66, nylon 46, all aromatic nylons and the like, may be used.

[0039] Although the reinforcing ribs 12c in the above example are in the form of an S-shaped curve substantially following the injection direction of the synthetic resin P, the reinforcing ribs can be arranged in various other forms, as shown in FIGs. 5 to 12.

[0040] By adopting an arrangement in which the reinforcing ribs form a plurality of connected triangles, as shown in FIG. 6, a truss-shaped arrangement is achieved. Inner stress, generated when the guide 10 is under load, can be balanced, and its bending strength and toughness can be enhanced.

[0041] As shown in FIGs. 7 and 8, a plurality of reinforcing ribs 12c are disposed in a radiating pattern which begins at the slide rail, which is at the outer end of the radiating pattern. The radiating ribs extend along the direction of flow of the synthetic resin P. A resulting enhanced fluidity of the resin during injection molding contributes to a reduction in injection pressure and a reduction in injection time.

[0042] As shown in FIGs. 9 and 10, a plurality of reinforcing ribs 12c extend in a vein-shaped arrangement. These ribs extend outwardly from a central rib which extends longitudinally in a direction substantially parallel to the slide rail. The synthetic resin P can be injected uniformly into the entire guide, since the flow of resin follows the directions of the ribs during injection molding. In these embodiments, the bending strength and toughness of the guide are further enhanced.

[0043] As shown in FIGs. 11 and 12, reinforcing ribs 12c are disposed in a honeycomb-shaped arrangement or a number sign- or pound sign-shaped arrangement. Here again, the flow of resin during injection molding follows the directions of the ribs, and the strength of the guide is enhanced.

[0044] In accordance with the invention, the reinforcing ribs of a slide rail supporting member extend in a direction such that the flow of synthetic resin P during injection molding follows the longitudinal directions of the ribs. Thus, the resin is molecularly oriented when it is solidified in such a way that the strength and toughness of the guide are dramatically improved. Furthermore, the crystal region of the resin injected into the guide is increased so that thermal shrinkage of the guide is decreased, and warpage, torsion and the like are reduced, even in a high temperature environment, and a stable guiding function is achieved. The injection pressure and injection time are also reduced, and a the production cost of the guide can be significantly reduced.

[0045] When the synthetic resin is a glass fiber-reinforcing resin, the orientation of the glass fibers F in the longitudinal direction of reinforcing ribs can be enhanced significantly, and a more uniform dispersion of the reinforcing glass fibers can be achieved. As a result, the strength of the guide can be significantly increased.

Claims

1. Synthetic resin guide (L) for a transmission device comprising an elongated rail (11) for longitudinal sliding engagement with a power transmission medium (C), and a rail supporting member (12) molded as a unit with the rail (11), the supporting member (12) comprising a plurality of reinforcing ribs (12c) which support the rail (11), the ribs (12c) being distributed along the length of the transmission device from a location adjacent one end of the rail (11) to

a location adjacent the opposite end of the rail (11), **characterized in that** the guide (L) is formed by injection molding and said reinforcing ribs (12c) extend in directions such that the flow of synthetic resin during injection molding substantially follows the longitudinal directions of the reinforcing ribs (12c).

2. Synthetic resin guide according to claim 1, **characterized in that** the synthetic resin is a glass fiber reinforced resin.

FIG. 1

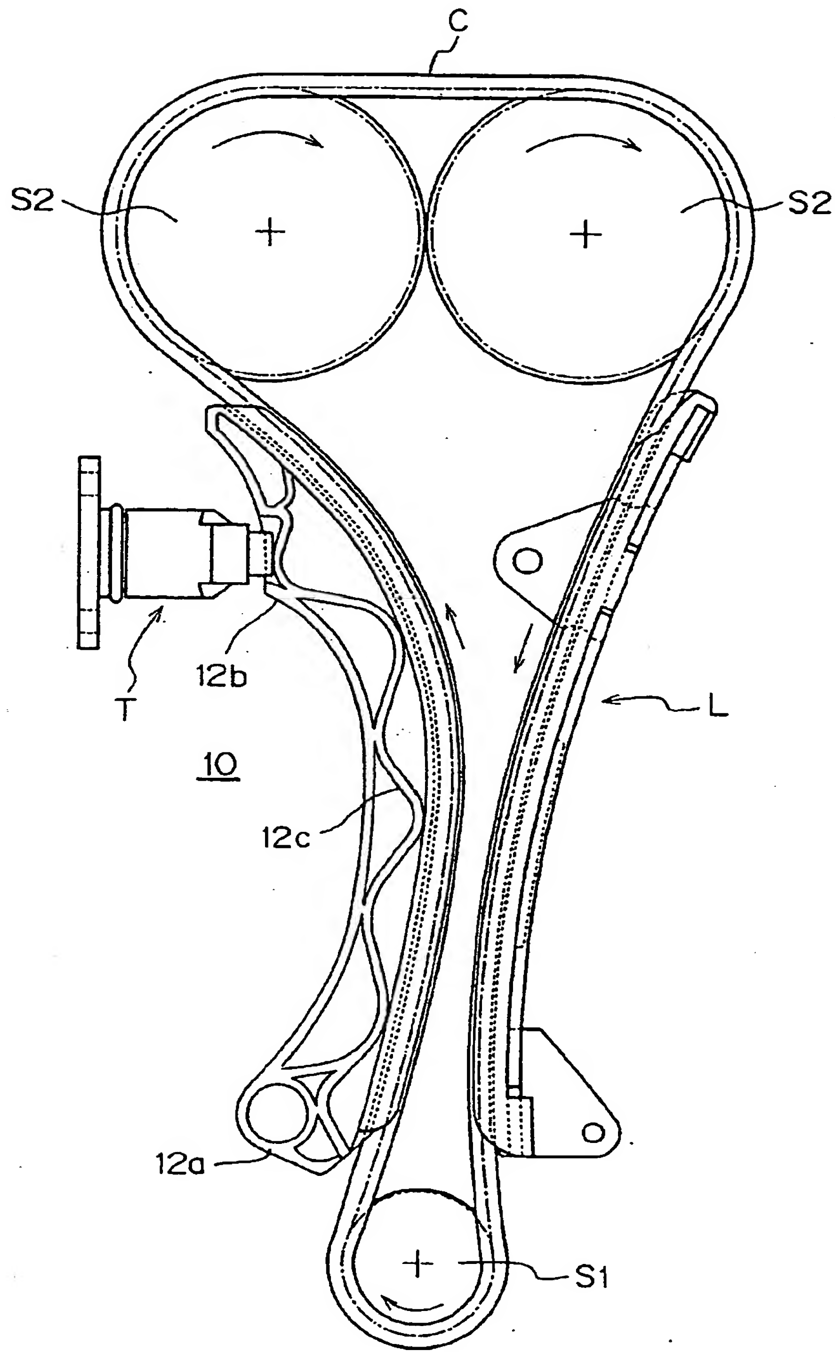


FIG. 2

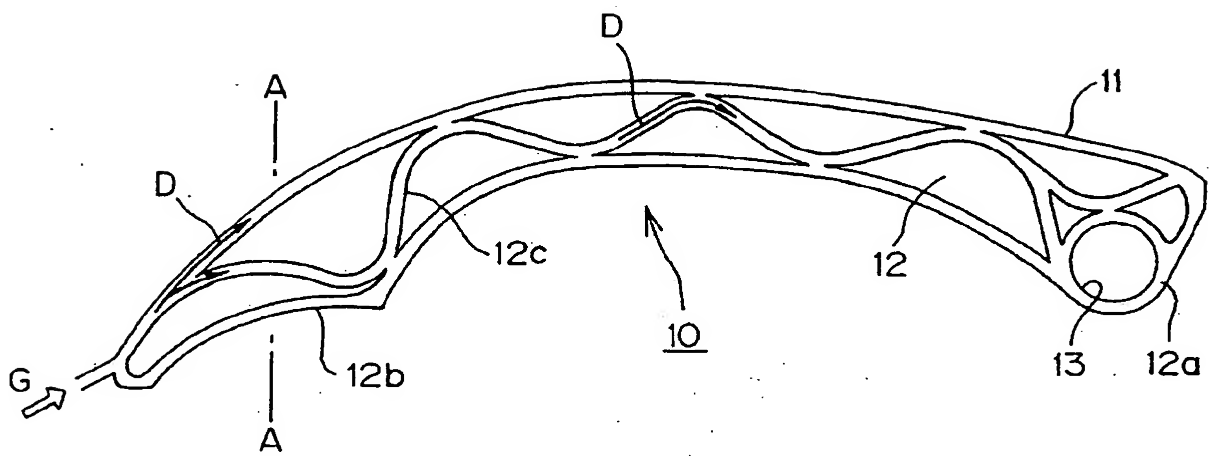


FIG. 3

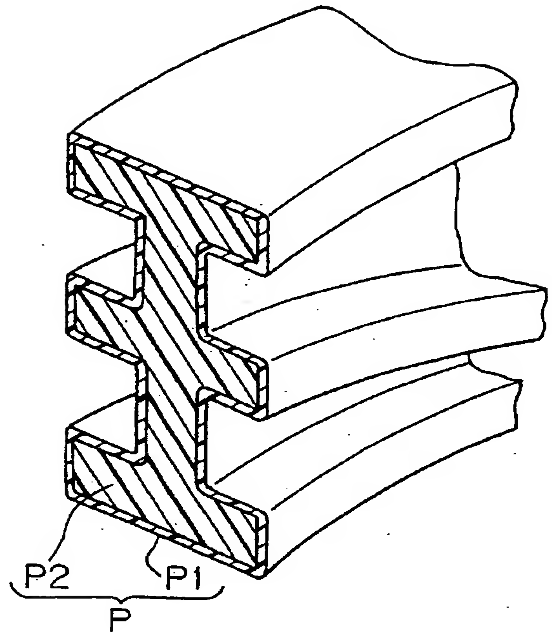


FIG. 4

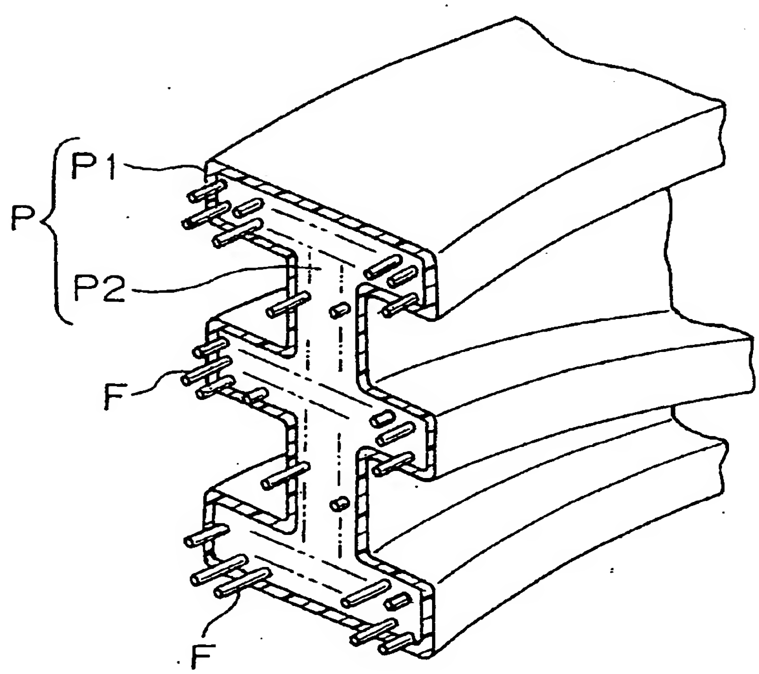


FIG. 5

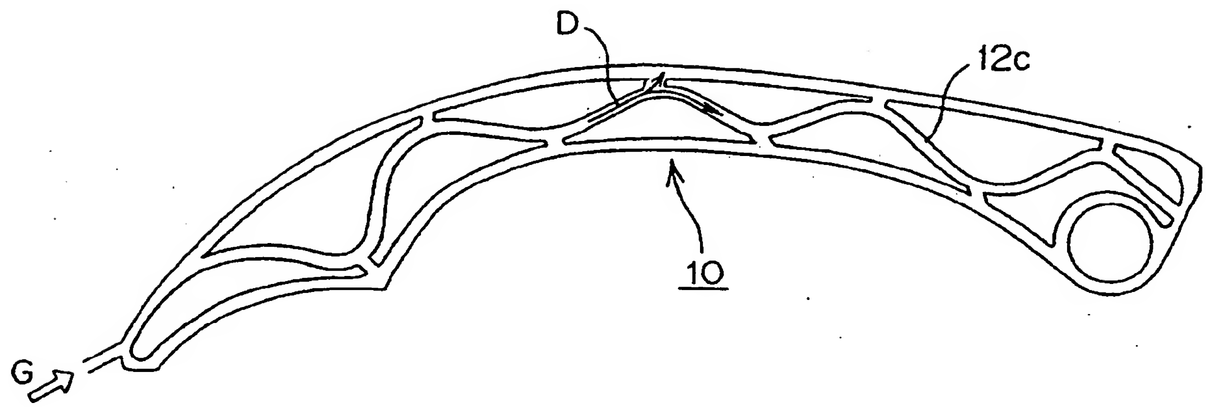


FIG. 6

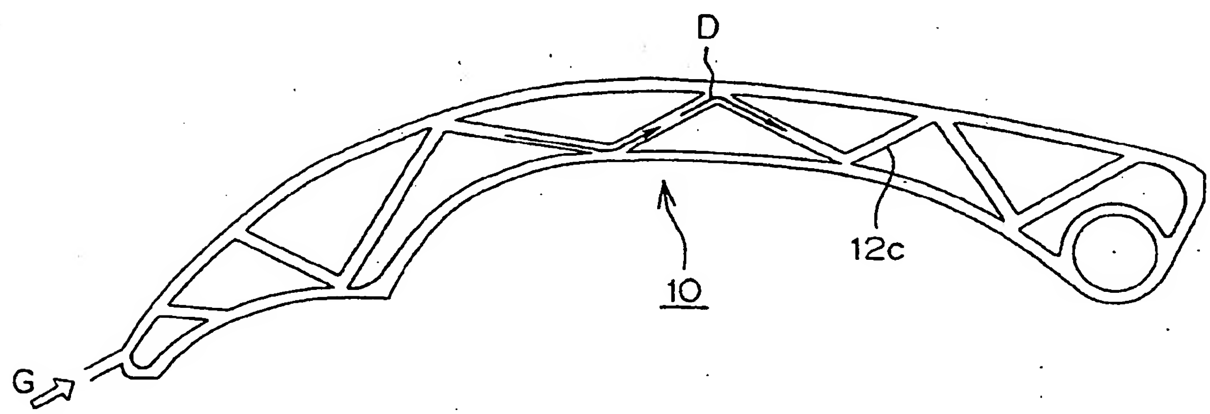


FIG. 7

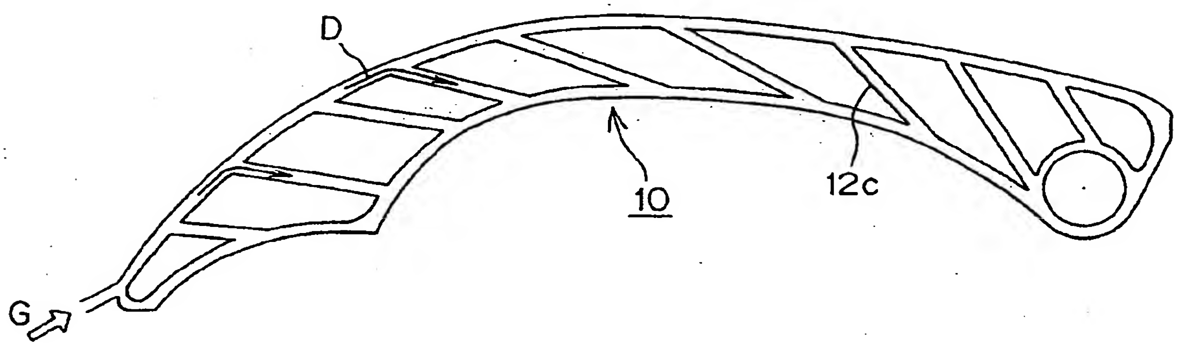


FIG. 8

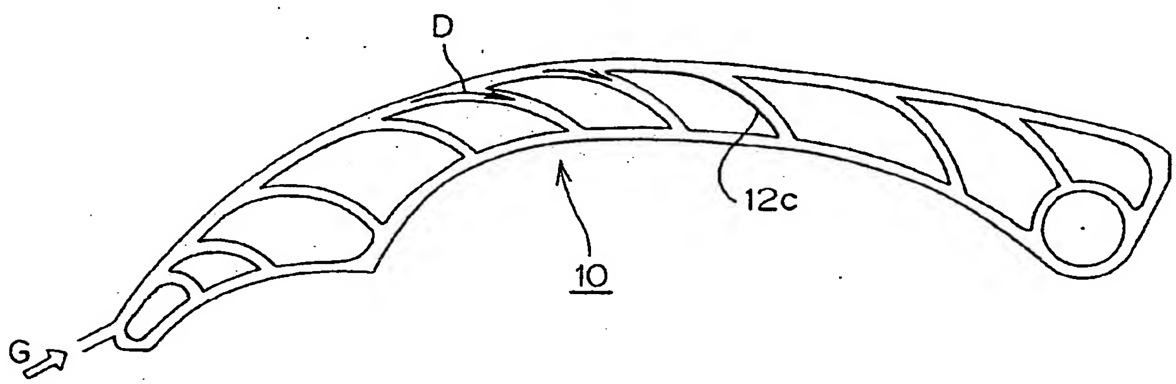


FIG. 9

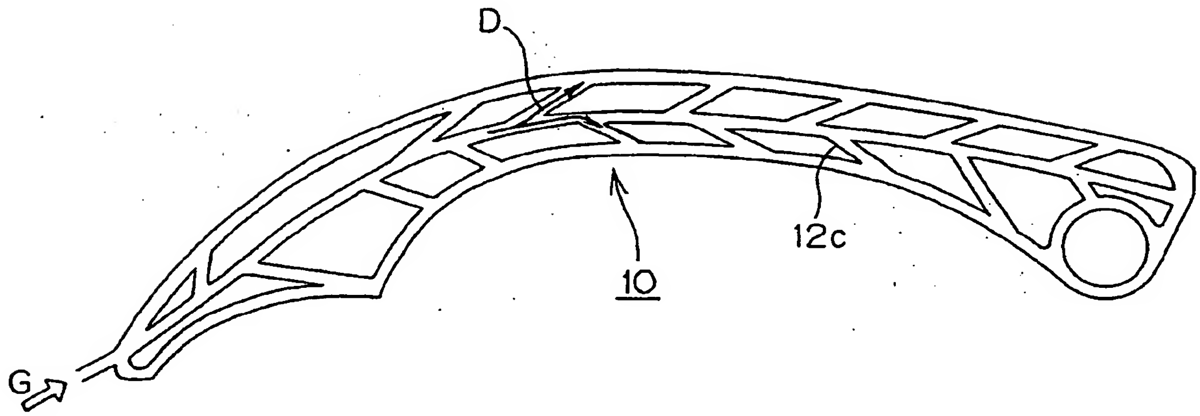


FIG. 10

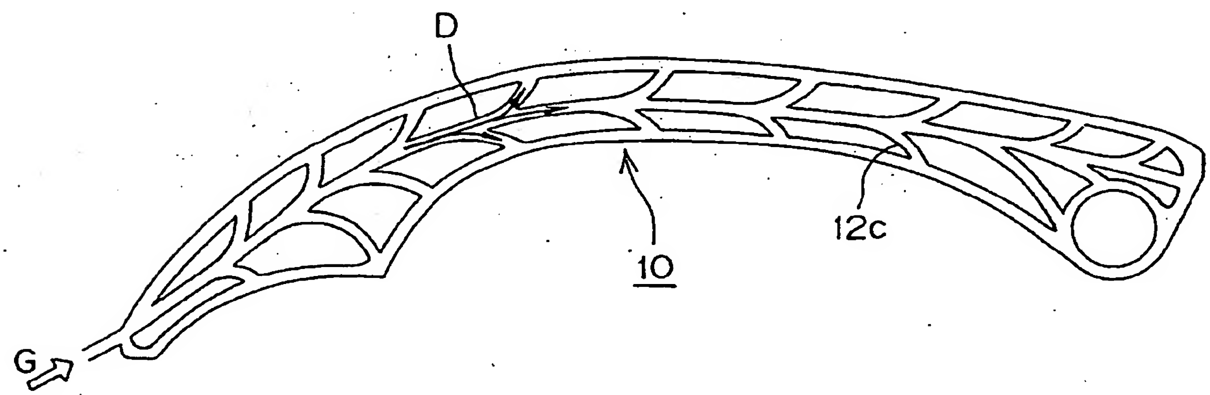


FIG. 11

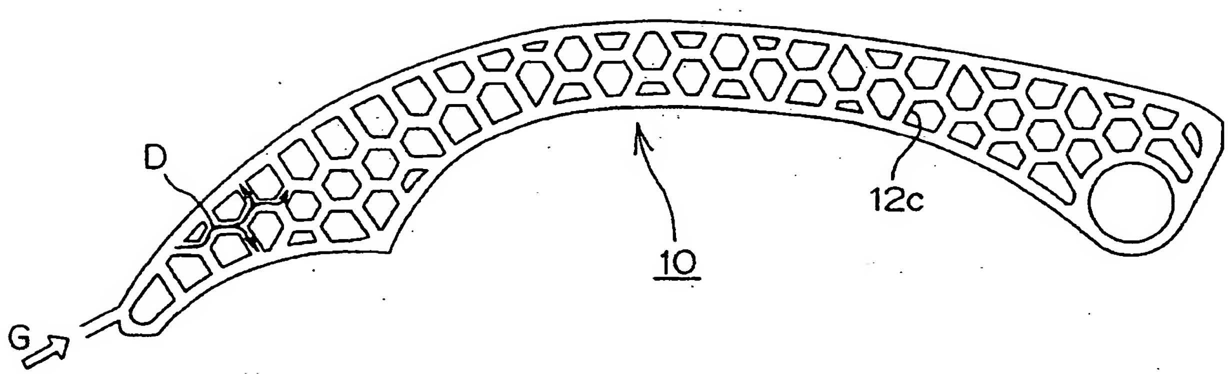
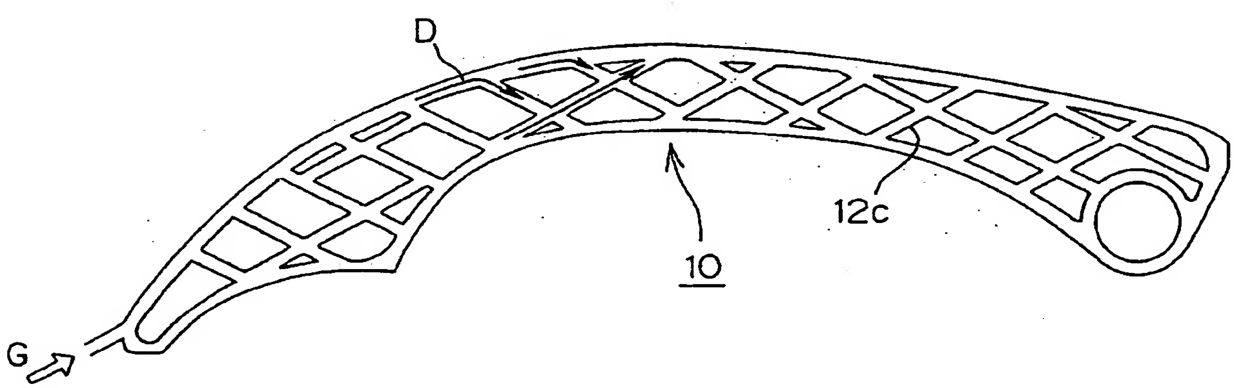
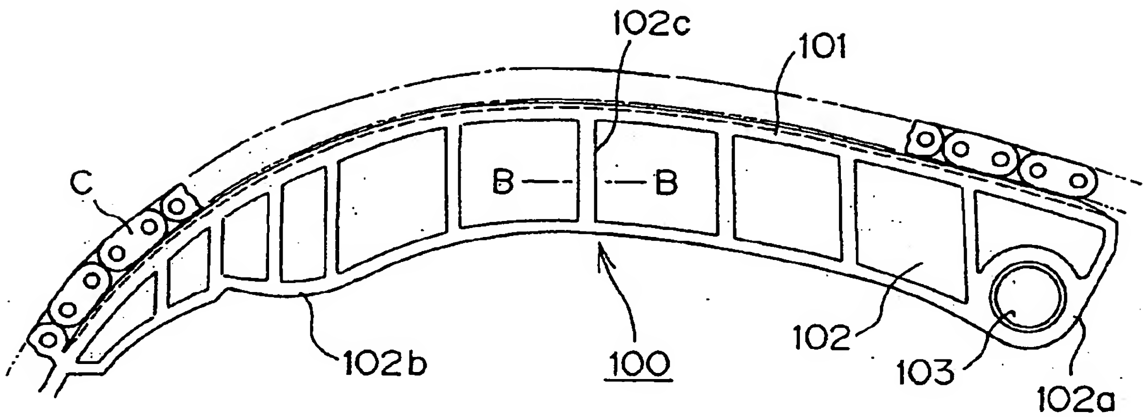


FIG. 12



F I G. 1 3

PRIOR ART



F I G. 1 4

PRIOR ART

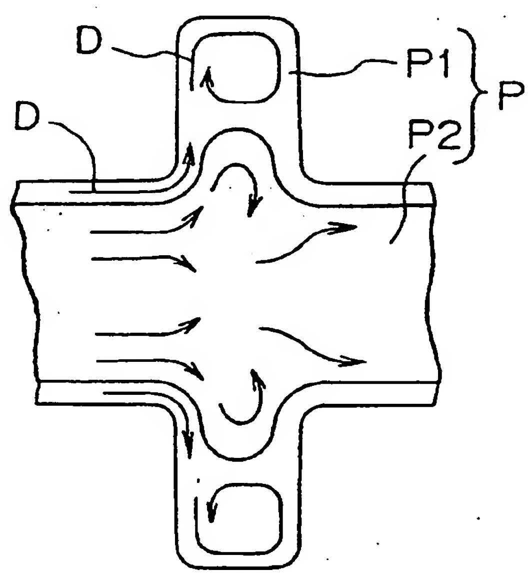


FIG. 15
PRIOR ART

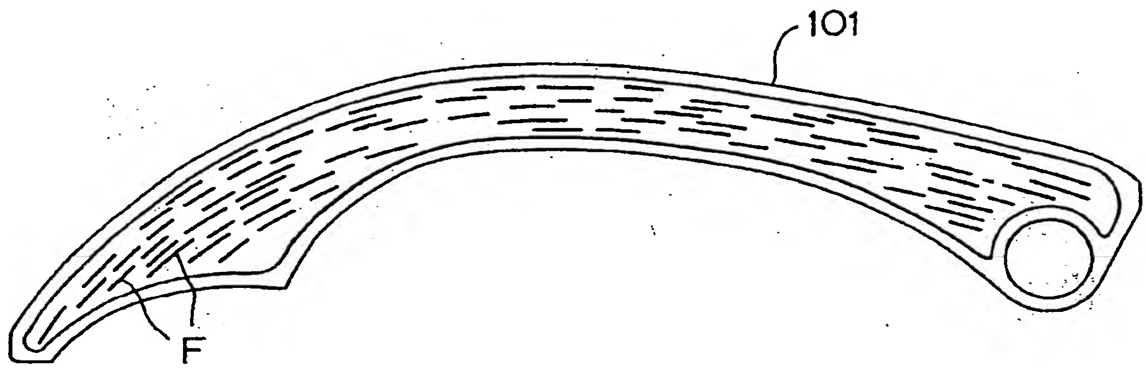
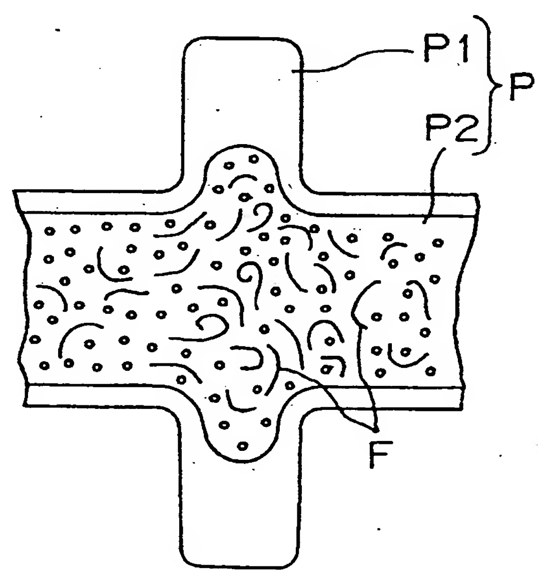


FIG. 16
PRIOR ART



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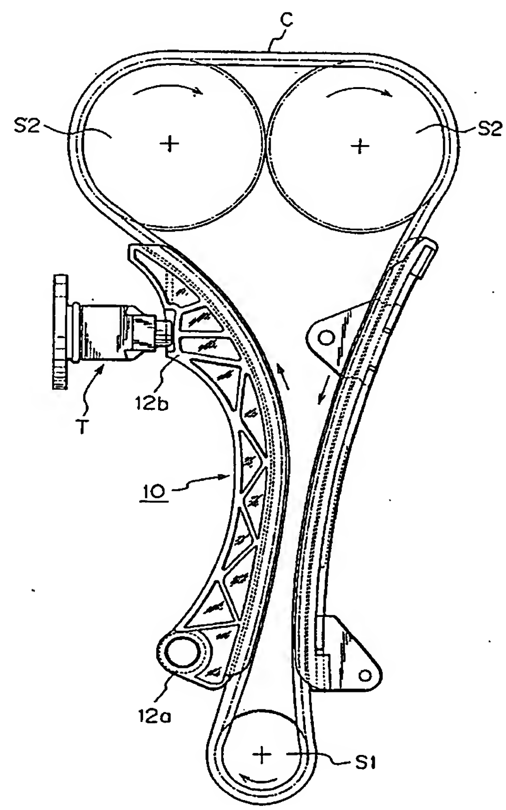
(54) Sandwich-molded guide for transmission device

(57) A guide (10) for a transmission device such as a chain (C) or belt, is injection molded using a sandwich-molding process. The process avoids the need for a complex mold and complex manufacturing steps. The guide (10) exhibits enhanced mechanical strength and excellent sliding contact properties and wear resistance in a compatible manner, and is also light in weight and has excellent durability. The sandwich-molded guide (10) comprises a slide rail (11) on which a chain (C) or belt slides, and a rail supporting member (12) integrally provided along with the slide rail (11). The slide rail (11) is composed of a material the principal component of which is a first polymeric material having wear resistance and heat resistance, and the rail supporting member (12) is composed of a material the principal component of which is a second polymeric material having higher strength than the material having the first polymeric material as its principal component. The slide rail (11) and the rail supporting member (12) are intimately joined to each other by injection molding using the sandwich molding process.

FIG. 1



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Description

[0001] This invention relates to a guide, composed of plastics, for a mechanical power transmission device such as a chain or a belt, in a motor vehicle engine or the like.

[0002] In motor vehicle engines, mechanical power is transmitted, for example from a crankshaft to a camshaft, by a power transmission medium such as an endless chain or a belt. A chain travels in a circulating path around a driving sprocket and a driven sprocket. A belt travels in a circulating path around a driving pulley and a driven pulley. The invention relates more specifically to a guide, composed of plastics material, for a power transmission device. The guide in accordance with the invention may be used as a fixed guide, or as a movable guide, to guide and/or regulate tension in, a power transmission medium such as a chain, belt or the like, which travels over the guide, while in sliding contact with the guide.

[0003] In general, in a motor vehicle engine, or other machine which utilizes a chain, a belt, or the like as a power transmission medium, a fixed or movable guide over which the transmission medium slides, is attached, by a mounting bolt, a pin, or a similar fastener, to an engine block, or to another frame member.

[0004] A movable guide, such as a tensioner lever or the like used in such a transmission device, imparts appropriate tension to a power transmission medium in order to prevent transmission failure due to excess stretching, or excess loosening of the circulating power transmission medium. A fixed guide, such as a guide rail or the like, limits the power transmission medium to a predetermined path of travel in order to prevent the power transmission medium from producing vibration noise, and to prevent sideward vibration, and disengagement.

[0005] A conventional movable guide, such as the chain tensioner guide 100 depicted in FIG. 10, is typically molded from a single synthetic resin. The guide 100 comprises a slide rail 101, which is in sliding contact with a traveling, power-transmitting chain C, and a rail supporting member 102 extending longitudinally along the back side of the slide rail. Referring to FIGs. 10 and 11, the rail supporting member 102 includes a boss 102a, having a mounting hole 103, allowing the rail supporting member to be attached to an engine block or the like so that it can function as a movable guide. A tensioner (not shown) abuts a tensioner abutting portion 102b of the rail supporting member 102 in order to apply the appropriate tension to the chain, thereby preventing excessive stretching, or excessive loosening, of the chain, either of which could result in transmission failure. Ribs 102c serve to reinforce the guide while minimizing its weight.

[0006] In the conventional guide 100, which is integrally molded from a single synthetic resin, the maintenance of good sliding contact and wear resistance in the slide rail 101 is incompatible with the achievement of adequate strength in the supporting member 102, especially in the environment of a motor vehicle engine, where temperatures around 200 °C may be encountered. When the guide 100 for the transmission device is molded from a plastics material having superior sliding contact properties and wear resistance, other desirable mechanical properties of the guide 100, such as strength, are sacrificed. Furthermore, when the cross-section of the guide is increased to compensate for its inadequate strength, the larger size of the guide requires more space, and makes installation of the guide onto an engine block wall more difficult.

[0007] To solve the above-mentioned problems a slide, proposed in Japanese Patent No. 2818795, includes a supporting member consisting of a high strength synthetic resin and a slide liner consisting of a synthetic resin having good wear resistance connected to the supporting member. Either the supporting member or the sliding lining body was used as a mold, and the other was injection molded. As an alternative, a chain tensioner described in Japanese laid-open Patent Publication No. Hei. 8-254253, was insertion-molded using a steel sheet as a core. In Japanese laid-open Patent Publication No. Hei. 9-324839, a guide rail was proposed in which a slide path liner was fitted to a carrier by a friction locking system.

[0008] To produce the slide disclosed in Japanese Patent No. 2818795, where either the supporting member or the slide lining body was used as a mold, and the other was injection molded, two molding steps were required. Moreover, to integrate both synthetic resin elements, it was necessary to form a dovetail groove by molding. Consequently, the mold structure became complex and manufacturing cost was increased.

[0009] In the chain tensioner disclosed in Japanese laid-open Patent Publication No. Hei. 8-254253, deformation could be generated in the guide itself as a result of the difference between the coefficients of expansion of the steel core material and the plastics material, resulting in breakage. Moreover, because of the weight of the steel core material it was not possible to achieve a weight reduction.

[0010] In the guide rail disclosed Japanese laid-open Patent Publication No. Hei. 9-324839, where the slide path liner and the carrier were fitted together releasably by a friction locking system, the manufacturing steps were complex, the manufacturing cost was high, and the friction locking portion was subject to breakage.

[0011] Accordingly, in prior art tensioner guides, reliability and mechanical strength of the guide rails were not entirely satisfactory.

[0012] It is, accordingly, a general object of the invention to solve the above-mentioned problems encountered with conventional guides for power transmission devices such as chains and belts.

[0013] Another object of the invention is to provide a guide which can easily be injection-molded without us-

ing a complex mold and complex manufacturing steps, and which has not only enhanced mechanical strength but also good sliding contact properties and good wear resistance.

[0014] Still another object of the invention is to provide a molded guide for a transmission device, which is light in weight and which has enhanced durability.

[0015] It is also an object of the invention to provide a power transmission apparatus, incorporating a power transmission device such as an endless chain or belt, and an improved guide or tensioner lever having the above-mentioned combined properties.

[0016] The sandwich-molded guide in accordance with the invention comprises a slide rail on which a power transmission medium slides, and a rail supporting member integral with, and extending along the slide rail. The slide rail is composed of a material the principal component of which is a first polymeric material having wear resistance and heat resistance. The rail supporting member is composed of a material the principal component of which is a second polymeric material having higher strength than that of the material having said first polymeric material as its principal component. The slide rail and the rail supporting member are intimately joined to each other by injection molding using a sandwich molding process.

[0017] In a preferred embodiment of the invention, the second polymeric material, is a composite material containing an inorganic material. In another preferred embodiment, the second polymeric material, is a long fiber reinforced polymeric material. In another preferred embodiment, surface layer portions of the slide rail the rail supporting member are integrally coating-molded from the first polymeric material having wear resistance and heat resistance.

[0018] In a preferred embodiment, both the first polymeric material and the second polymeric material are nylon 66.

[0019] In still another preferred embodiment, the first polymeric material and said second polymeric material are nylon 6.

[0020] In still another preferred embodiment the first polymeric material is nylon 46 and the second polymeric material is nylon 66.

[0021] Finally, in still another preferred embodiment, the first and second polymeric materials are both aromatic nylon.

[0022] The sandwich-molding process of this invention is a process of manufacturing a molded product consisting of two kinds of polymeric materials, a so-called "two-layered" molded product, by injection-molding two kinds of molten polymeric materials into a mold, whose shape corresponds to the external shape of the product to be molded. The two polymeric materials are molded simultaneously or substantially simultaneously. A known injection-molding machine for sandwich molding can be used in the sandwich-molding process according to the invention. Although known injection-molding machines for sandwich molding include various sandwich nozzles, in the case of an injection-molding machine for sandwich molding including parallel type sandwich nozzles, the filling of the mold with two kinds of polymeric materials can be precisely controlled in accordance with the shape of the molded product by moving a torpedo (that is, a pour switching member for switching between a skin material and a core material) forward or backward in the parallel type sandwich nozzles.

[0023] The first and second polymeric materials, which are the principal component materials of the slide rail and the rail supporting member respectively, are not significantly limited except that the first should have good wear and heat resistance and the second should be stronger than the first. However, it is preferable that both polymeric materials be fused with each other at the boundary region where they come together, so that they are intimately joined, and that they have a chemical affinity and substantially the same shrinkage characteristics. More specifically, the first and second polymeric materials may include polyamide resin or the like selected from nylon 6, nylon 66, nylon 46 or aromatic nylon etc.

[0024] Further, if the material of the rail supporting member, the principal component of which is the second polymeric material, has higher strength than the material of the slide rail, the principal component of which is the first polymeric material, even if the second polymeric material is the same as the first polymeric material they can be used together. Especially in the case where the same polymer is used to form both the slide rail and the rail support, the strength of the rail support may be enhanced by dispersing long fiber-shaped inorganic elements, or a powdered inorganic compound or the like, in the polymer.

[0025] According to the invention, a material whose principal component is a first polymeric material having wear resistance and heat resistance is used as the material of the slide rail, and a second material whose principal component is a polymeric material having higher strength is used as the material of the rail supporting member. Both materials are integrally attached to each other by a sandwich molding process, so that the wear resistance and the heat resistance of the slide rail material and the high strength properties of the rail support material, complement each other. Both materials are integrally joined with each other in a completely fused state, resulting in high strength properties that could not be attained by a conventional mechanical connection.

[0026] Preferred embodiments of the invention will now be described in detail, by way of example only, with reference to the accompanying drawings, in which:

[0027] FIG. 1 is an elevational view of a power transmission incorporating a guide in accordance with the invention, for the purpose of explaining modes of use of the invention;

[0028] FIG. 2(a) is a top plan view of a sandwich-

molded guide in accordance with a first embodiment of the invention;

[0029] FIG. 2(b) is a front elevational view thereof;

[0030] FIG. 2(c) is a bottom plan view thereof;

[0031] FIG. 3 is a cross-sectional view taken on surface A-A in FIG. 2(b);

[0032] FIG. 4 is a cross-sectional view taken on plane B-B in FIG. 2(b);

[0033] FIG. 5 is a cross-sectional view taken on surface C-C in FIG. 2(b);

[0034] FIG. 6(a) is a top plan view of a sandwich-molded guide in accordance with a second embodiment of the invention;

[0035] FIG. 5(b) is a front elevational view thereof;

[0036] FIG. 5(c) is a bottom plan view thereof;

[0037] FIG. 7 is a cross-sectional view taken on surface A-A in FIG. 6(b);

[0038] FIG. 8 is a cross-sectional view taken on plane B-B in FIG. 6;

[0039] FIG. 9 is a cross-sectional view taken on surface C-C in FIG. 6;

[0040] FIG. 10 is a front elevational view of a conventional movable guide;

[0041] FIG. 11 is a cross-sectional view taken on surface A-A in FIG. 10; and

[0042] FIG. 12 is a cross-sectional view taken on plane B-B in FIG. 10.

[0043] Preferred embodiments of the invention will be described below with reference to the drawings.

[0044] FIGs. 1 - 5 relate to a sandwich-molded guide 10 for a transmission device in accordance with a first embodiment of the invention.

[0045] As shown in FIG. 1, a sandwich-molded guide 10 for a transmission device, in accordance with this embodiment, is used inside a motor vehicle engine in which power is transmitted by an endless chain C, which travels in a circulating path around a driving sprocket S1 and a driven sprocket S2. More specifically, the sandwich-molded guide 10 is used as a movable guide, over which the chain C slides, and which controls tension in the chain.

[0046] As shown in FIG. 2(a) and 2(b), the sandwich-molded guide 10 comprises a slide rail 11 having a substantially arc-shaped contact surface on which the chain C (FIG. 1) slides. The guide comprises a rail supporting member 12, provided on and projecting vertically from the back of slide rail 11. The rail supporting member 12 extends longitudinally along the length of the slide rail 11, and projects from the rear of the slide rail in a direction perpendicular to the contact surface. The rail supporting member 12 includes a boss 12a having a mounting hole 13 for mounting the guide 10 on an engine block wall so that it can serve as a movable guide. The guide 10 also comprises a tensioner abutting portion 12b for engagement with a tensioner T (FIG.1). The tensioner functions to prevent transmission failure due to excess stretching or excess loosening of the chain C, by applying appropriate tension to the chain. The tensioner also includes reinforcing ribs 12c, which reinforce the tensioner while also reducing its weight.

[0047] As shown in FIGS. 3 - 5, the slide rail 11 is composed of a material the principal component of which is a first polymeric material having wear resistance and heat resistance. Any nylon from the group consisting of nylon 6, nylon 66, nylon 46, and all aromatic nylons, may be used as the first polymeric material, and the appropriate material may be selected depending on the environment in which it is to be used, especially the temperature to which the guide will be exposed within the engine in which the guide is to be installed.

[0048] On the other hand, the rail supporting member 12 is composed of a material the principal component of which is a second polymeric material. The second polymeric material comprises dispersed, long, fiber-shaped inorganic elements, or dispersed particulate inorganic material, in a polymer such as nylon 6, nylon 66 or the like. The mechanical strength of the rail supporting member 12 is enhanced compared with that of the slide rail body 11, by the inclusion of the dispersed inorganic fiber-shaped elements or particulate material.

[0049] The wear-resistant and heat-resistant material containing the first polymeric material, and the high-strength material containing the second polymeric material, are integrally joined with each other in a completely fused state by simultaneously injection-molding the slide rail 11 and the rail supporting member 12 by a sandwich molding process, using an injection-molding machine having parallel sandwich nozzles for sandwich molding. The slide rail 11 and the rail supporting member 12 are fused at the boundary region X (FIGS. 3 - 5) so that they are intimately joined to each other.

[0050] The sandwich-molded guide 10 thus obtained can be manufactured easily in a single mold, without using a conventional complex mold or a multi-step manufacturing process. Because the slide rail 11 and the rail supporting member 12 are integrally joined to each other in a complete fused state, the sandwich-molded guide 10 exhibits both higher mechanical strength and enhanced sliding contact properties and wear resistance, in a compatible manner. Moreover, because it is light in weight and has enhanced endurance, it is well adapted to serve as a movable guide. Accordingly, the sandwich-molded guide 10, when used with a tensioner inside a motor vehicle engine to control tension in a circulating chain, prevents power transmission failures resulting from excess stretching and excess loosening of the chain.

[0051] FIGs. 6 - 9 relate to a sandwich-molded guide 20 for a transmission device in accordance with a second embodiment of the invention.

[0052] As in the case of the sandwich-molded guide 10 of the first embodiment, the sandwich-molded guide 20 comprises a slide rail 21 having a substantially arc-shaped sliding contact surface on which a circulating chain C slides. The guide also comprises a rail supporting member 22, provided on and projecting vertically

from the back of slide rail 21. The rail supporting member 22 extends longitudinally along the length of the slide rail 21, and projects from the rear of the slide rail in a direction perpendicular to the contact surface. The rail supporting member 22 includes a boss 22a having a mounting hole 23 for mounting the guide 20 on an engine block wall so that it can serve as a movable guide. The guide 20 also comprises a tensioner abutting portion 22b for engagement with a tensioner (not shown). The tensioner functions to prevent transmission failure due to excess stretching or excess loosening of the chain C, by applying appropriate tension to the chain. The tensioner also includes reinforcing ribs 22c, which reinforce the tensioner while also reducing its weight.

[0053] The slide rail 21 is composed of a material the principal component of which is a first polymeric material having wear resistance and heat resistance as in the first embodiment. Any one of materials of nylon 6, nylon 66, nylon 46, and all aromatic nylons, may be used as the first polymeric material. On the other hand, the rail supporting member 22 is composed of a material the principal component of which is a second polymeric material. The second polymeric material is an enhanced polymeric material comprising dispersed, long, fiber-shaped, elements of inorganic material, or dispersed, particulate inorganic material in a polymer such as nylon 6, nylon 66 or the like.

[0054] The slide rail 21 and the rail supporting member 22 are molded by a sandwich molding process, in which they are intimately joined to each other. At the same time, the surface layers of the slide rail 21 and rail supporting member 22 are integrally coating-molded by the same wear-resistant and heat-resistant material of which the slide rail 21 is composed.

[0055] To sandwich-mold such a structure in a sandwich-molding injection molding machine, a material having, as its principal component, the wear-resistant and heat-resistant first polymeric material is first injected from a sandwich nozzle into a single mold having a hollow shaped so that it corresponds to the outer shape of the molded guide. The injected polymeric material forms the surface layer portion of the entire guide.

[0056] Then, as soon as the surface layer portion is formed, two kinds of molten polymeric materials are simultaneously injected to form the slide rail 21 and the rail supporting member 22. These polymeric materials consist of a material the principal component of which is the first, wear-resistant and heat-resistant polymeric material, and second material the principal component of which is a second polymeric material containing as reinforcement, dispersed, long, fiber-shaped elements of inorganic material, or dispersed particulate inorganic material.

[0057] In the sandwich-molded guide 20 thus obtained, the slide rail 21 and the rail supporting member 22 are joined more strongly to each other than the corresponding elements of the first embodiment. The improved strength of the joint between the slide rail 21 and the rail supporting member 22 is achieved by coating-molding of their surface layers. Furthermore, since the surface layer portions of the boss 22a and mounting hole 23 on one end of the rail supporting member 22 are injection-molded by the material whose principal component is the wear-resistant and heat-resistant first polymeric material, the sandwich-molded guide 20 can function smoothly for a long period of time as a pivotally movable guide for applying appropriate tension in order to avoid excessive tension or loosening of a circulating chain.

[0058] As explained above, in the sandwich-molded guide for a transmission device according to the invention, the slide rail is composed of a material the principal component of which is a first polymeric material having good wear resistance and heat resistance, and the rail supporting member is composed of a material the principal component of which is a second polymeric material having enhanced strength. By integrally fusing the slide rail and the rail supporting member by a sandwich molding process, the sliding contact properties and wear resistance required for the slide rail on which the chain slides in a high temperature environment such as the inside of a motor vehicle engine are achieved. At the same time the high level of strength required for the rail supporting member is ensured over a long period of time. The sandwich molded construction enables these two objectives to be achieved in a compatible manner. The sandwich-molded guide for a transmission device according to the invention can be utilized as a movable guide, such as a tensioner lever, to apply appropriate tension to a belt, chain, or the like in a transmission device or similar mechanism. The sandwich molded guide can also be used as a fixed guide such as a guide rail, which guides and limits the traveling path of a belt, chain, or the like.

[0059] The sandwich-molded guide for a transmission device according to the invention is injection-molded in a single mold, using a sandwich-molding process. Thus, the molding of the slide rail, molding of the rail supporting member and joining of the slide rail to the rail supporting member can be carried out at the same time or substantially at the same time in a single step. Complex manufacturing steps and special molds are thus avoided, manufacture of the guide is simplified, and the manufacturing cost of the guide can be significantly reduced. Furthermore, since a core composed of a steel sheet or the like is not required, the weight of the guide can be reduced, and a reduction in the cost of fuel needed to operate an internal combustion engines can be achieved as a result.

[0060] By injection molding using a sandwich-molding process two kinds of polymeric materials can be injected simultaneously or substantially simultaneously, and the two kinds polymeric materials can be integrally joined to each other in a complete fused state. Accordingly, the wear resistance and heat resistance, of the first polymeric material and the high strength properties of the

second polymeric material can be achieved compatibly, and can complement each other in the guide. Moreover, the material the principal component of which is the first polymeric material, and the material the principal component of which is the second polymeric material, can be selected freely taking into account the relationships between wear resistance heat resistance, and high strength properties, depending on the temperature of the environment in which the guide will be used.

[0061] Obviously, various minor changes and modifications of the invention are possible in the light of the above teaching. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

Claims

1. Sandwich-molded guide (10; 20) for guiding and maintaining tension in a power transmission medium (C) in a transmission device, the guide (10; 20) comprising a slide rail (11; 21) on which a power transmission medium (C) slides, and a rail supporting member (12; 22) integral with, and extending along the slide rail (11; 21), **characterized in that** the slide rail (11; 21) is composed of a material the principal component of which is a first polymeric material having wear resistance and heat resistance, the rail supporting member (12; 22) is composed of a material the principal component of which is a second polymeric material having higher strength than the material having the first polymeric material as its principal component, and the slide rail (11; 21) and the rail supporting member (12; 22) are intimately joined to each other by injection molding using a sandwich molding process.

2. Sandwich-molded guide according to claim 1, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material.

3. Sandwich-molded guide according to claim 1 or 2, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material.

4. Sandwich-molded guide according to one of claims 1 to 3, **characterized in that** the surface layer portions of the slide rail (11; 21) and the rail supporting member (12; 22) are integrally coating-molded from the first polymeric material having wear resistance and heat resistance.

5. Sandwich-molded guide according to one of claims 1 to 4, **characterized in that** the first polymeric material and the second polymeric material are nylon 66.

6. Sandwich-molded guide according to one of claims 1 to 4, **characterized in that** the first polymeric material and the second polymeric material are nylon 6.

7. Sandwich-molded guide according to one of claims 1 to 4, **characterized in that** the first polymeric material is nylon 46 and the second polymeric material is nylon 66.

8. Sandwich-molded guide according to one of claims 1 to 4, **characterized in that** the first polymeric material and the second polymeric material are both aromatic nylon.

9. Sandwich-molded guide according to one of claims 1 to 8, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material, and wherein the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and heat resistance.

10. Sandwich-molded guide according to one of claims 1 to 9, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material, and wherein the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and heat resistance.

11. Sandwich-molded guide according to one of claims 1 to 10, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material, and wherein the first polymeric material and the second polymeric material are nylon 66.

12. Sandwich-molded guide according to one of claims 1 to 11, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material, and wherein the first polymeric material and the second polymeric material are nylon 66.

13. Sandwich-molded guide according to one of claims 1 to 12, **characterized in that** the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and

heat resistance, and wherein the first polymeric material and the second polymeric material are nylon 66.

14. Sandwich-molded guide according to one of claims 1 to 13, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material, and wherein the first polymeric material and the second polymeric material are nylon 6.

15. Sandwich-molded guide according to one of claims 1 to 14, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material, and wherein the first polymeric material and the second polymeric material are nylon 6.

16. Sandwich-molded guide according to one of claims 1 to 15, **characterized in that** the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and heat resistance, and wherein the first polymeric material and the second polymeric material are nylon 6.

17. Sandwich-molded guide according to one of claims 1 to 16, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material, and wherein the first polymeric material is nylon 46 and the second polymeric material is nylon 66.

18. Sandwich-molded guide according to one of claims 1 to 17, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material, and wherein the first polymeric material is nylon 46 and the second polymeric material is nylon 66.

19. Sandwich-molded guide according to one of claims 1 to 18, **characterized in that** the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and heat resistance, and wherein the first polymeric material is nylon 46 and the second polymeric material is nylon 66.

20. Sandwich-molded guide according to one of claims 1 to 19, **characterized in that** the material the principal component of which is the second polymeric material, is a composite material containing an inorganic material, and wherein the first polymeric material and the second polymeric material are both aromatic nylon.

21. Sandwich-molded guide according to one of claims 1 to 20, **characterized in that** the material the principal component of which is the second polymeric material, is a long fiber reinforced polymeric material, and wherein the first polymeric material and the second polymeric material are both aromatic nylon.

22. Sandwich-molded guide according to one of claims 1 to 21, **characterized in that** the surface layer portions of the slide rail (21) and the rail supporting member (22) are integrally coating-molded by the first polymeric material having wear resistance and heat resistance, and wherein the first polymeric material and the second polymeric material are both aromatic nylon.

FIG. 1

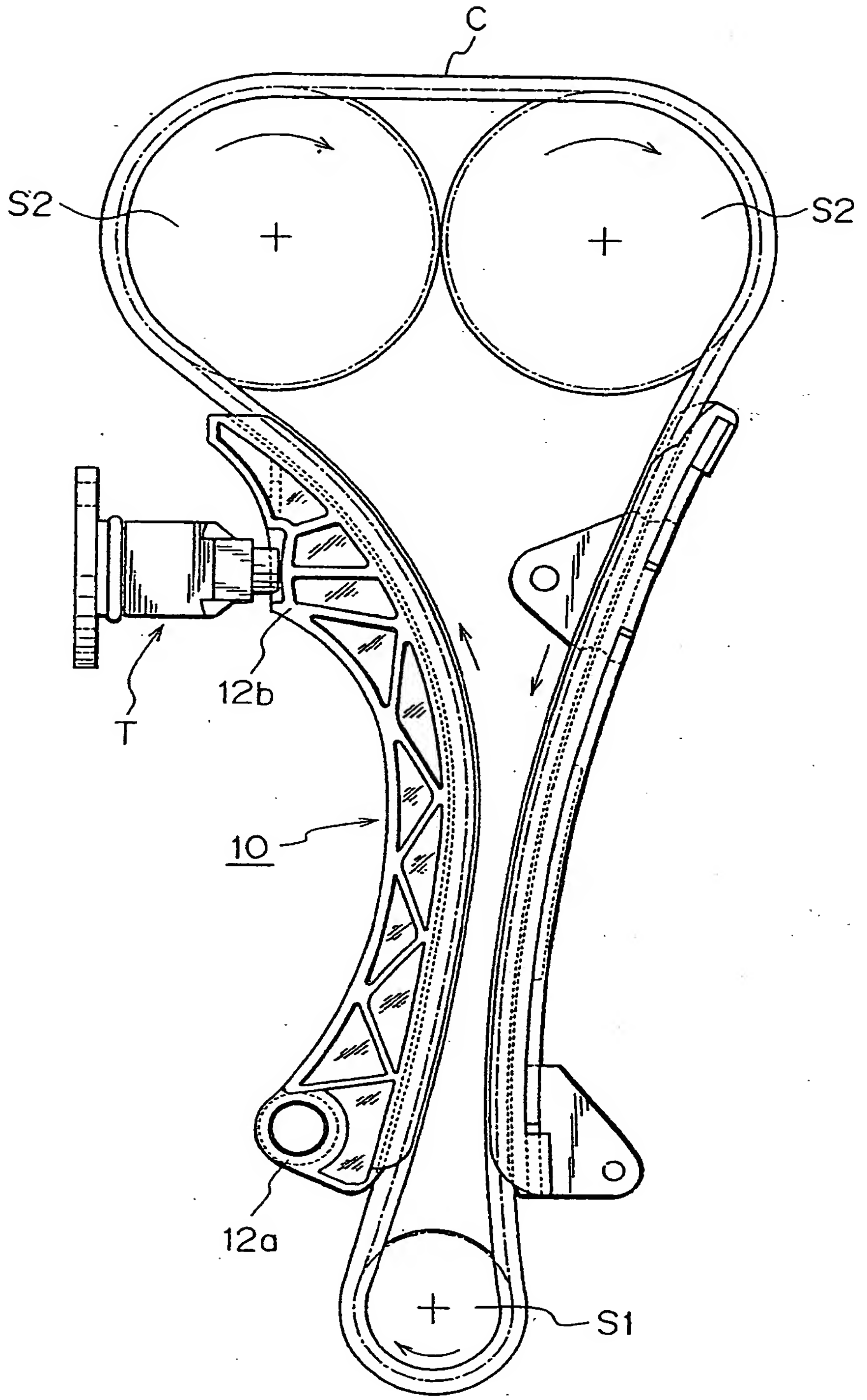


FIG. 2(a)

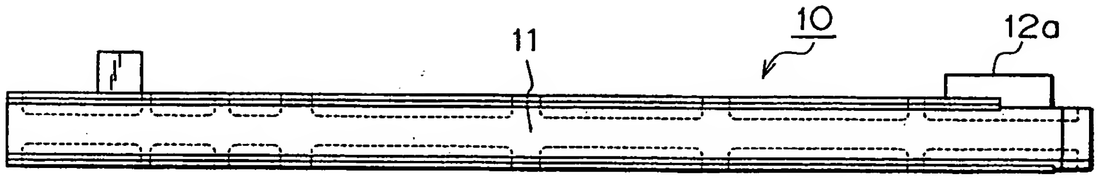


FIG. 2(b)

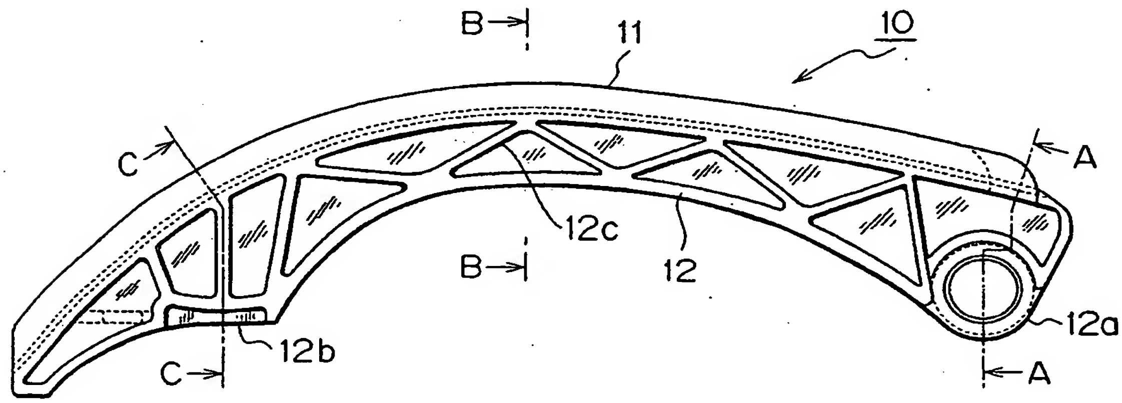


FIG. 2(c)

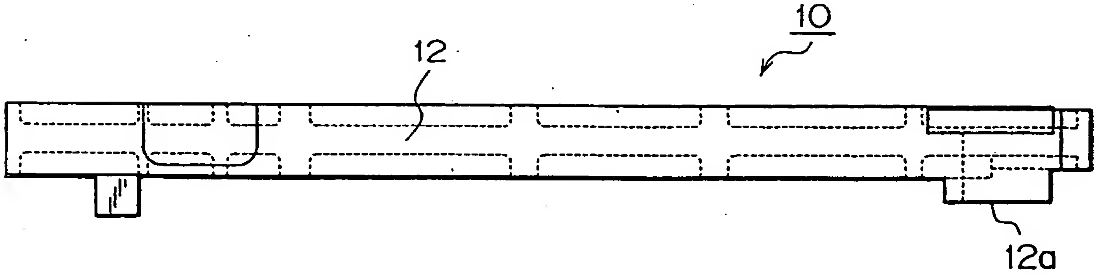


FIG. 3

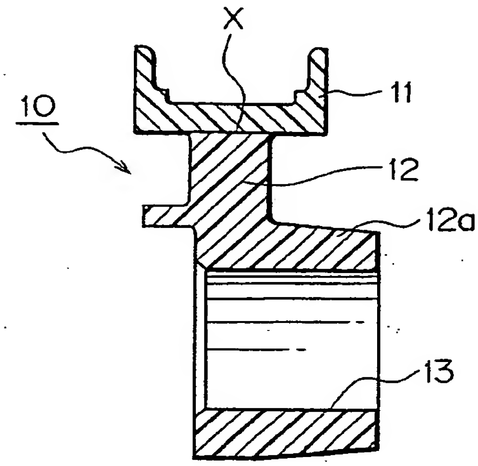


FIG. 4

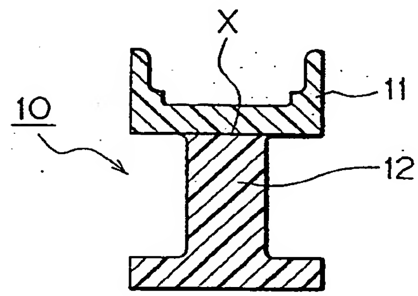


FIG. 5

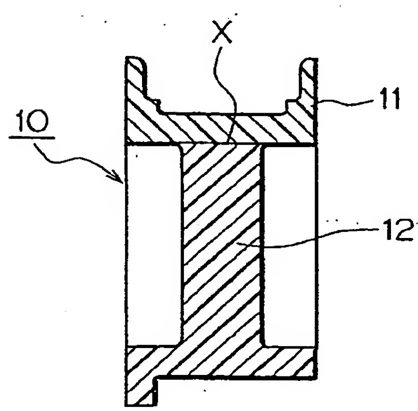


FIG. 6(a)

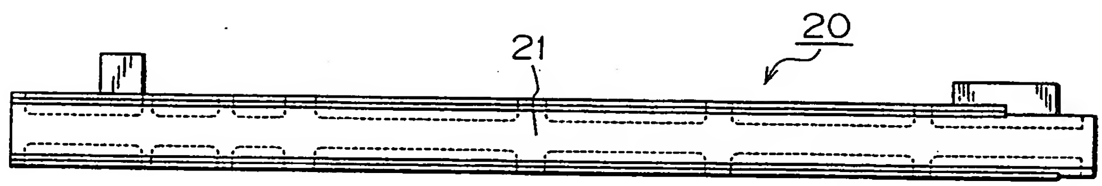


FIG. 6(b)

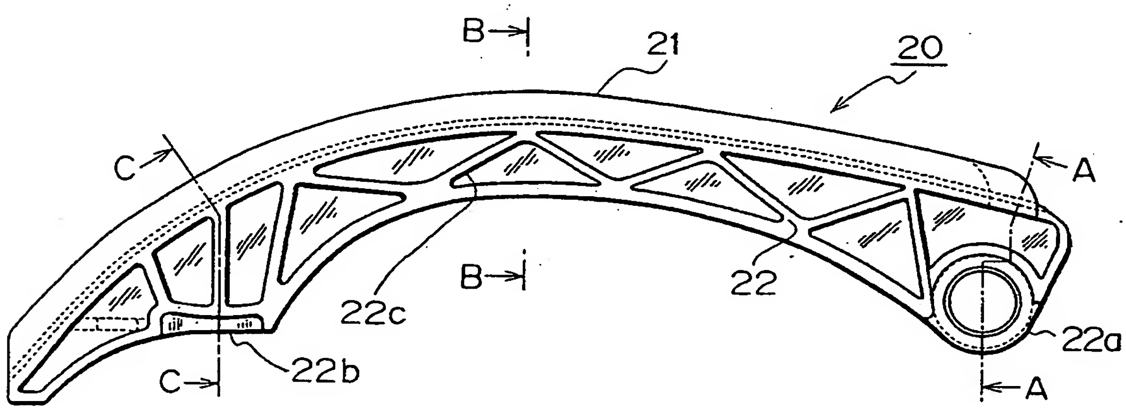


FIG. 6(c)

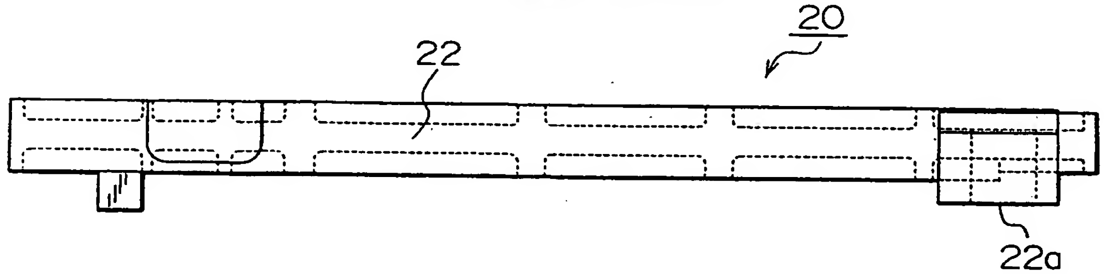


FIG. 7

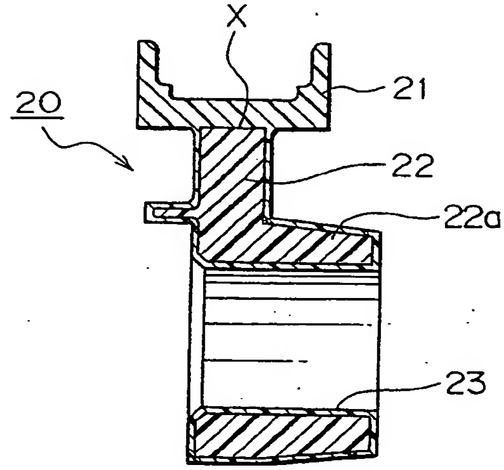


FIG. 8

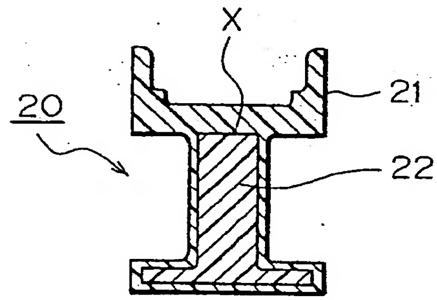


FIG. 9

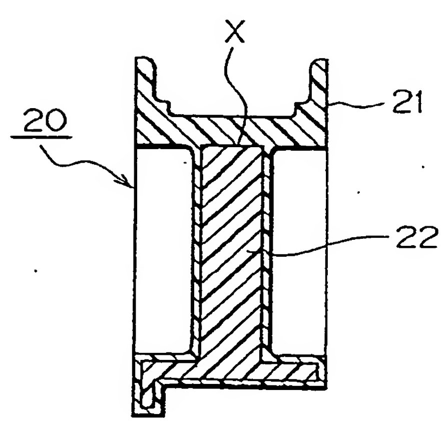


FIG. 10
PRIOR ART

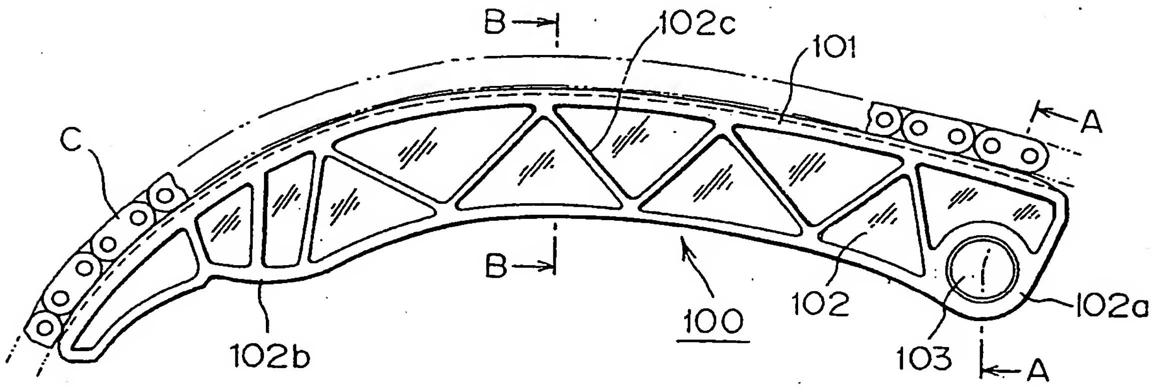


FIG. 11
PRIOR ART

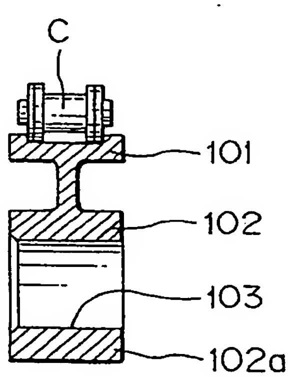
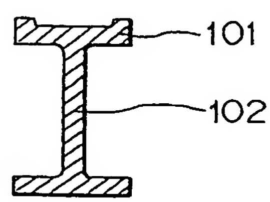


FIG. 12
PRIOR ART.



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 01 2962

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Y	DE 199 23 905 A (SCHAEFFLER WAELZLAGER OHG) 30 November 2000 (2000-11-30) * column 3, line 57-61; claims 1-3 * * column 2, line 38-44 * ---	1-22	
Y	GB 2 351 136 A (TSUBAKIMOTO CHAIN CO) 20 December 2000 (2000-12-20) * claim 1; figure 1 * ---	1-22	
P,A	US 2002/050184 A1 (TADAZU SUZUKI) 2 March 2002 (2002-03-02) * claim 1; figure 1 * ---	1-22	
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 02, 26 February 1999 (1999-02-26) & JP 10 292855 A (TSUBAKIMOTO CHAIN CO), 4 November 1998 (1998-11-04) * abstract * -----	1-22	TECHNICAL FIELDS SEARCHED (Int.Cl.7): F16H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	23 October 2002	Dupuis, J-L

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 01 2962

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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23-10-2002

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

FR2736123

PN - FR2736123 A 19970103
PD - 1997-01-03
PR - DE19951023912 19950630
OPD - 1995-06-30
TI - Guide rail esp. for i.c. engine control chain tensioner
AB - The guide rail consists of a main body (12) and an anti-friction coating (13) which are moulded together by a bi-component injection process so that once they have set they are fixed together. The material which forms the body is injected into the mould first, followed immediately afterwards by the coating material. The material forming the body (32) is a plastic with reinforcing additives, for example, a polyamide reinforced with glass fibres, while the outer coating is another plastic which is resistant to abrasion.
IN - BAUR PETER; LOEFFLER ALF
PA - BOSCH GMBH ROBERT (DE)
ICO - R16H7/08T3
EC - F16H7/08 ; B29C45/16G ; F16H7/18
IC - F16H7/08 ; B29C45/16
CT - EP0279934 A [A]; DE7123773U U [A]; FR2276514 A [A]; DE3525746 A [A]

TI - Guide rail esp. for i.c. engine control chain tensioner - has body and anti-friction coating moulded together in molten state
PR - DE19951023912 19950630
PN - FR2736123 A1 19970103 DW199711 F16H7/08 009pp
- DE19523912 A1 19970327 DW199718 F16H7/08 005pp
PA - (BOSC) BOSCH GMBH ROBERT
IC - B29C45/16 ;F01L1/04 ;F16H7/08
IN - BAUR P; LOEFFLER A
AB - FR2736123 The guide rail consists of a main body (12) and an anti-friction coating (13) which are moulded together by a bi-component injection process so that once they have set they are fixed together. The material which forms the body is injected into the mould first, followed immediately afterwards by the coating material. The material forming the body (32) is a plastic with reinforcing additives, for example, a polyamide reinforced with glass fibres, while the outer coating is another plastic which is resistant to abrasion.
- ADVANTAGE - The rail is manufactured in a single operation, with improved adhesion between components.
- (Dwg.2/2)
OPD - 1995-06-30
AN - 1997-111481 [11]

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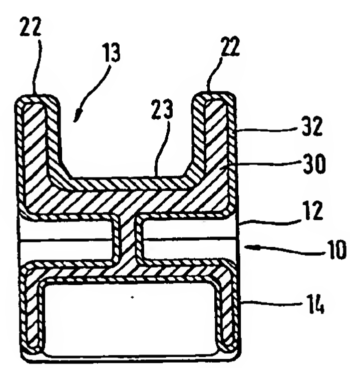
(72) **Inventeur(s) :** LOEFFLER ALF et BAUR PETER.

(73) **Titulaire(s) :**

(74) **Mandataire :** CABINET HERRBURGER.

(54) RAIL DE GUIDAGE, NOTAMMENT RAIL TENDEUR POUR L'ENTRAINEMENT PAR ARBRE A CAMES D'UN MOTEUR A COMBUSTION INTERNE.

(57) Rail de guidage comportant un corps de base (12) et un corps de revêtement glissant (13) relié à celui-ci pour guider la chaîne de commande. La matière du corps de base (12) et celle du corps de revêtement glissant (13) sont mises à l'état fondu pour qu'à la solidification il se forme une liaison par la matière entre les deux corps (12, 13). Pour cette fabrication on utilise le procédé d'injection à deux composants en injectant d'abord la matière du corps de revêtement (13) puis celle du corps de base (12) à l'intérieur de la cavité.



FR 2 736 123 - A1

Etat de la technique.

L'invention concerne un rail de guidage, notamment un rail tendeur pour un entraînement par arbre à cames d'un moteur à combustion interne, comprenant un corps de base et un corps de revêtement glissant formé sur le corps de base pour guider la chaîne de commande.

Les rails de guidage correspondant à ce type servent à guider et à tendre les chaînes et autres moyens d'entraînement des arbres à cames ou équipements accessoires de véhicules automobiles. C'est pourquoi les rails de guidage doivent pouvoir résister aux contraintes énormes exercées par une chaîne.

Selon le document DE-A-37 06 136, il est connu de réaliser le rail tendeur avec un corps de base et un corps de revêtement glissant tenu par le corps de base. Le revêtement glissant est relié au corps de base par une liaison par la force et par la forme s'étendant dans la direction de circulation de la chaîne.

Avantages de l'invention.

La présente invention concerne ainsi un rail de guidage correspondant au type défini ci-dessus, caractérisé en ce que les matières du corps de base et du corps de revêtement glissant sont appliquées l'une sur l'autre à l'état fondu pour que lorsque les deux matières se solidifient, il se réalise une liaison par la matière entre le corps de base et le corps de revêtement glissant.

Ce rail de guidage offre l'avantage d'être réalisable en totalité au cours d'une seule opération. La solidification simultanée des deux matières du corps de base et du corps constituant le corps de revêtement glissant constitue une liaison par la matière entre ces deux corps.

Selon une autre caractéristique il est particulièrement avantageux que le rail de guidage soit fabriqué selon un procédé d'injection à deux composants.

Si le corps du revêtement glissant présente une forme de U on a un guidage particulièrement bon pour la chaîne de commande.

Le fait de limiter la pellicule extérieure, de préférence au corps de revêtement glissant en forme de U, offre l'avantage de ne pas trop affaiblir la solidité du rail de guidage par la matière instable de la pellicule extérieure.

De manière complète, suivant des caractéristiques avantageuses :

- le corps de base et le corps de revêtement glissant sont réalisés par un procédé d'injection à deux composants, par injection d'abord de la matière constituant le corps de revêtement glissant puis par injection immédiatement après de la matière constituant principalement le corps de base, dans la cavité du moule d'injection ;
- la matière qui constitue principalement le corps de base forme un coeur et la matière réalisant le corps de revêtement glissant constitue une pellicule entourant au moins partiellement le coeur ;
- le coeur est en matière plastique avec des additifs de renforcement ;
- la pellicule extérieure est en une matière plastique résistant à l'abrasion ;
- le corps de revêtement glissant est en forme de U ;
- la pellicule est principalement réalisée sur le corps de revêtement glissant en forme de U.

Dessins.

Un exemple de réalisation de l'invention est représenté dans les dessins et sera décrit ci-après de manière plus détaillée.

Ainsi :

- la figure 1 est une coupe longitudinale d'un rail de guidage selon l'invention,
- la figure 2 est une vue en coupe selon la ligne II-II de la figure 1.

Exemple de réalisation.

Les figures 1 et 2 montrent un rail tendeur portant la référence 10 destiné par exemple à une chaîne de commande d'un moteur à combustion interne. Le rail tendeur 10 est formé d'un corps de base 12 et d'un corps de revêtement glissant 13.

Le corps de base 12 possède par exemple une ossature 14 avec un grand nombre d'entretoises 15 donnant la solidité nécessaire au corps de base 12. Un perçage 16 recevant un goujon non représenté est prévu dans le corps de base 12. Le perçage 16 permet de fixer le rail tendeur 10 à un élément non représenté du moteur à combustion interne ; le rail tendeur 10 est monté pivotant sur le goujon non représenté. Un élément de compression, également non représenté, communique au rail tendeur la force antagoniste correspondante pour tendre la chaîne de commande. La direction de circulation de la chaîne de commande est indiquée par la flèche 17.

Il apparaît selon la figure 1 que le rail tendeur 10 présente une forme courbe. Sur l'arc extérieur du rail tendeur 10 on a formé sur le corps de base 12, le corps de revêtement glissant 13 ; comme le montre la figure 2, ce corps peut par exemple avoir une forme de U. Le corps de revêtement glissant 13, en forme de U, comprend deux branches 22 et un fond 23 pratiquement plan entre les branches 22. Les branches 22 assurent le guidage latéral nécessaire à la chaîne de commande. Le fond 23 constitue la surface d'appui et ainsi la surface de tension pour la chaîne de commande.

Selon la figure 2, le corps de base 12 se compose d'un coeur 30, par exemple en polyamide renforcé par des fibres de verre. Une pellicule extérieure 32 entoure le coeur 30. Cette pellicule est par exemple réalisée en un polyamide non renforcé, stabilisé à la chaleur. La matière du coeur 30 a pour but de donner la solidité nécessaire au corps de base 12 et au rail tendeur 10. La pellicule extérieure 32 sert par contre à former au moins le corps de revêtement glissant 13. La matière de la pellicule extérieure 32 doit résister à l'abrasion.

La fabrication du rail tendeur 10 se fait selon un procédé dit d'injection à deux composants. Ainsi, on injecte tout d'abord la matière de la peau extérieure 32 dans le moule d'injection. Puis immédiatement on injecte la matière du coeur 30 dans la cavité du moule d'injection. La matière de la pellicule extérieure 32 est poussée à la suite par la matière extrudée dans le moule d'injection, dans les creux et ainsi, en particulier, contre les parois, de sorte que le coeur 30 est au

moins entouré sensiblement par la pellicule extérieure 32. Il est important que les deux matières soient injectées directement l'une à la suite de l'autre pour que la matière qui forme la pellicule 32 soit encore fluide lors de l'injection de la matière constituant le coeur 30. Ainsi, lors de la solidification, il se réalise une liaison par la matière entre la matière du coeur 30 et la pellicule 32. Une liaison par la matière utilise les forces moléculaires à l'intérieur des matériaux ou à la surface des matériaux.

On peut envisager, par une mise en forme particulière du moule d'injection et/ou par le choix de certains paramètres d'injection, de concentrer la peau extérieure 32 principalement sur le corps de revêtement glissant 13 en forme de U. Ainsi, la solidité de la matière du coeur 30 du rail tendeur 10 n'est pratiquement pas touchée.

On peut en outre envisager d'autres procédés de fabrication utilisant l'état fondu des deux matières, par exemple le procédé appelé « monosandwich ».

R E V E N D I C A T I O N S

1°) Rail de guidage, notamment rail tendeur pour la chaîne de commande d'un moteur à combustion interne, comprenant un corps de base et un corps de revêtement glissant formé sur le corps de base pour guider la chaîne de commande,
caractérisé en ce que
les matières du corps de base (12) et du corps de revêtement glissant (13) sont appliquées l'une sur l'autre à l'état fondu pour que lorsque les deux matières se solidifient, il se réalise une liaison par la matière entre le corps de base (12) et le corps de revêtement glissant (13).

2°) Rail de guidage selon la revendication 1,
caractérisé en ce que
le corps de base (12) et le corps de revêtement glissant (13) sont réalisés par un procédé d'injection à deux composants, par injection d'abord de la matière constituant le corps de revêtement glissant (13) puis par injection immédiatement après de la matière constituant principalement le corps de base (12), dans la cavité du moule d'injection.

3°) Rail de guidage selon l'une quelconque des revendications 1 ou 2,
caractérisé en ce que
la matière qui constitue principalement le corps de base (12) forme un coeur (30) et la matière réalisant le corps de revêtement glissant (13) constitue une pellicule (32) entourant au moins partiellement le coeur (30).

4°) Rail de guidage selon la revendication 3,
caractérisé en ce que
le coeur (30) est en matière plastique avec des additifs de renforcement.

5°) Rail de guidage selon la revendication 3,
caractérisé en ce que
la pellicule extérieure (32) est en une matière plastique résistant à l'abrasion.

6°) Rail de guidage selon la revendication 1, caractérisé en ce que le corps de revêtement glissant (13) est en forme de U.

7°) Rail de guidage selon la revendication 6, caractérisé en ce que la pellicule (32) est principalement réalisée sur le corps de revêtement glissant en forme de U.

1 / 2

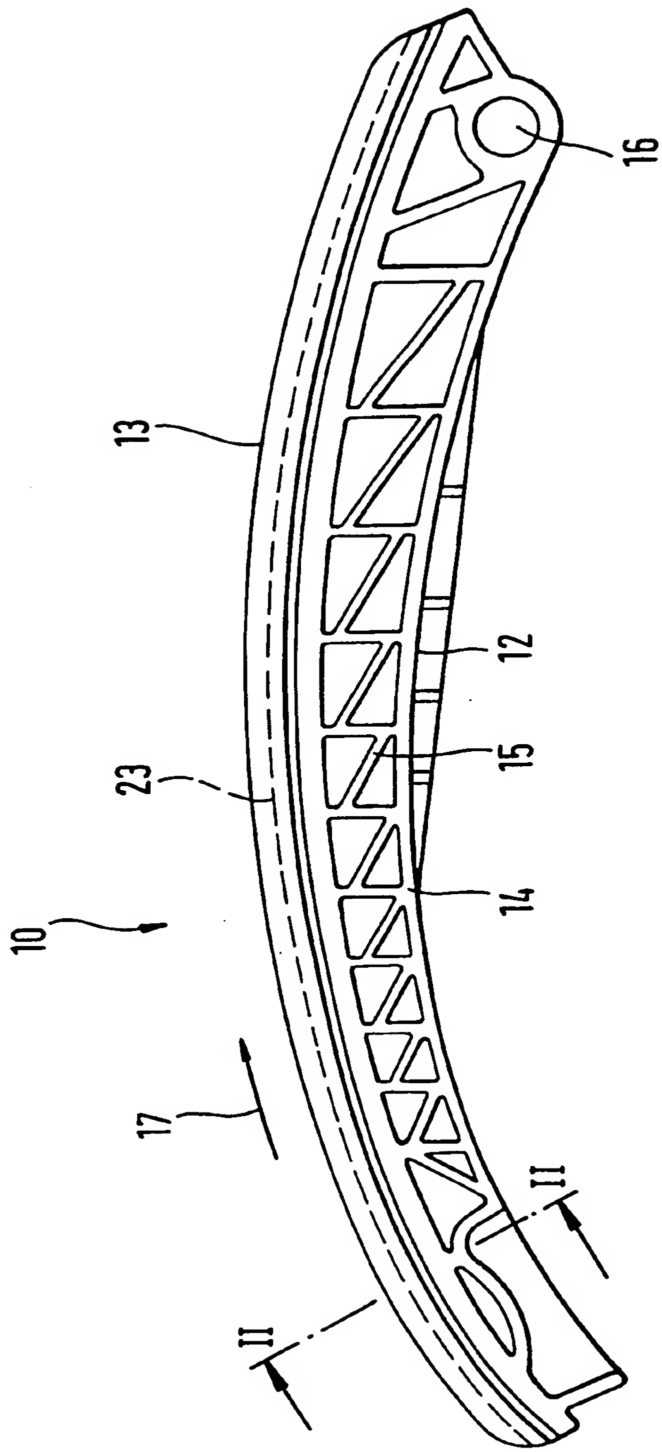


FIG.1

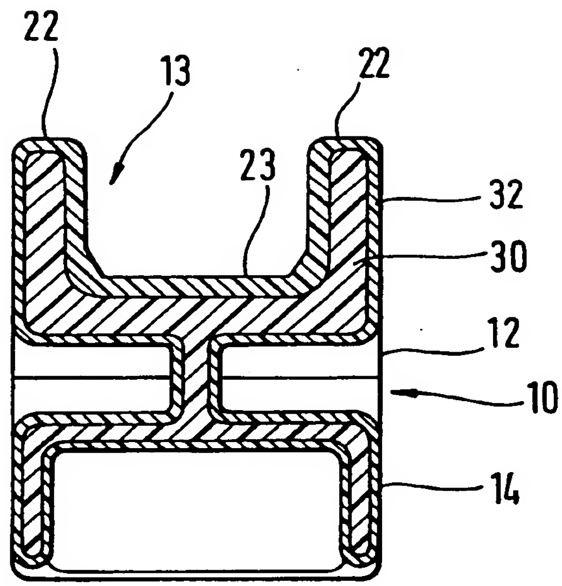


FIG. 2